

Explosives: (1) any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion (with substantially instantaneous release of gas and heat), unless such compound, mixture, or device is otherwise specifically classified by DOT; (2) all material classified as Class A, Class B, or Class C explosive by DOT.

Lead (leading) wire: an insulated expendable wire used between the electric power source and the electric blasting cap circuit.

Misfire: an explosive charge that failed to detonate.

Mudcapping (bulldozing, adobe blasting, or dobying): blasting by placing a quantity of explosives against a rock or other object without confining the explosives in a drill hole.

Peak particle velocity: a measure of how fast the ground moves during an explosive blast.

Primer: a cartridge or container of explosives into which a detonator or detonating cord is inserted or attached.

Scaled distance: a scaled factor (ft/lb units) of the potential damage to a structure, based on the distance from the nearest structure to the blast site and the weight of explosives per delay.

Springing: the creation of a chamber or pocket in the bottom of a drill hole so that larger quantities of explosives may be inserted; made by the use of a moderate quantity of explosives.

Stemming: a suitable inert incombustible material or device used to confine or separate explosives in a drill hole, or to cover explosives in mudcapping.

SECTION 30

CONTRACT DIVING OPERATIONS

30.A GENERAL

30.A.01 Diving shall not be utilized as a work method if the work objective can be more safely and efficiently accomplished by another means, e.g., using remote controlled television systems in lieu of divers.

30.A.02 Surface supplied air shall be utilized whenever possible in accordance with the practical constraints of diving operations.

30.A.03 Any failure to meet the requirements of this Section will be cause for rejection or cessation of operations.

30.A.04 All contract diving operations shall be performed in accordance with this manual.

30.A.05 The USACE Command, at their discretion, may elect to implement and enforce more stringent diving requirements than stated herein, but under no circumstances will the operational requirements be less than specified in this section.

30.A.06 Contractors shall demonstrate that:

- a. each diver potentially exposed to hyperbaric environments is medically fit as attested by a licensed physician.
- b. each dive team member has documented training and/or experience consistent with the performance requirements of the scope of work.
- c. the Dive Plan format adheres to prescribed safe operating procedures.

30.A.07 Divers will wait at least 12 hours before flying after any dive: this interval should be extended to 24 hours following multiple days of repetitive dives.

30.A.08 Each dive team member shall have current nationally recognized certification in first aid and CPR. First aid training should include the use of oxygen systems required in this section.

30.A.09 Contract diving operations will be monitored and/or inspected by USACE employees who are certified as divers, diving supervisors, or diving inspectors through HQUSACE sponsored training courses; however, use of trained monitors/inspectors with other credentials will be considered on a case-by-case basis and approved in writing by the District Diving Coordinator or USACE Command Diving Coordinator (DDC/UDC).

30.A.10 When diving at altitudes of 300 m (1000 ft) or more of elevation above sea level, contractors shall use appropriate high altitude decompression tables that compensate for the increased elevation.

30.A.11 Contractors shall develop and maintain a safe practices manual that encompasses the contractor's entire diving program.

a. The safe practices manual shall include, as a minimum, the following:

- (1) safety procedures and checklists;
- (2) assignments and responsibilities of dive team members;
- (3) equipment certification, procedures, and checklists;
- (4) emergency procedures for fire, equipment failure, adverse weather conditions, and medical illness or injury; and
- (5) requirements for inspections.

b. The manual shall be submitted to the USACE Command Dive Coordinator for review at least fifteen days prior to the commencement of dive operations. The manual shall be accepted by the Dive Coordinator prior to the commencement of dive operations.

c. The manual shall be available to all dive team members and Government representatives at the dive location.

30.A.12 The contractor shall submit verification of satisfactory completion of medical fitness examinations for each dive team member who is, or is likely to be, exposed to hyperbaric pressure.

a. This verification, along with an approval for diving, will be performed and signed by a licensed physician and will be submitted to the USACE prior to the commencement of diving operations. This examination will be repeated every twelve months with verification submitted to the USACE.

b. Each diver shall be reexamined after injury requiring medical attention or illness requiring hospitalization.

30.A.13 A dive operations plan shall be developed and implemented by the contractor for each separate diving operation.

a. As a minimum, the plan shall contain the following:

- (1) names and duties of dive team members, including diving supervisor;
- (2) date, time, and location of the dive operation;
- (3) diving mode to be utilized (SCUBA, surface-supplied air, etc.), giving a description of the backup air supply;
- (4) nature of work to be performed by the divers and requirements for inspections;
- (5) surface and underwater conditions, to include visibility, temperature, thermal protection, and currents;
- (6) activity hazard analysis for each phase of work, to include the hazards associated with flying after diving;
- (7) maximum depth and bottom time (altitude adjustments to dive tables shall be made for dives made at altitudes of 300 m (1000 ft) or more above sea level);
- (8) emergency management plan, to include emergency procedures, means of notification, telephone numbers (for ambulance, doctors, and recompression chamber), and locations of evacuation route, nearest USCG rescue center, and emergency assistance;
- (9) lockout/tagout procedures, including procedures for dealing

with differential water pressures due to unequal water elevations;

(10) equipment certification, procedures, and checklists and requirements for special tools and equipment; and

(11) the following statement: "If for any reason the dive plan is altered in mission, depth, personnel, or equipment, the USACE Command Diving Coordinator (UDC) at the district level shall be contacted and shall review any revision prior to actual operation."

b. This plan shall be submitted to the district and reviewed and accepted by the DDC/UDC and the Safety and Occupational Health Office prior to commencement of diving operations.

c. A copy of the accepted plan shall be at the diving location whenever diving is conducted.

d. The plan shall be made available to the government representative: all dive plans will become a part of the contract file.

30.A.14 Prior to each dive, and at the scene of the dive, a Pre-Dive Conference shall be held with all members of the dive team and a representative of the contractor with sufficient authority to implement any requirements made by the USACE diving inspector or coordinator.

30.A.15 Prior to each dive, the entire dive team will be briefed in detail on the following (as a minimum):

- a. description of mission and location, including drawings and/or photographs pertinent to the mission and equipment and materials that are to be installed as part of the mission;
- b. description of diving apparatus/equipment and craft to be used;
- c. maximum working depth with estimated bottom times and water temperatures;
- d. names and duties of personnel on the team (when possible, incorporate at least one person on the dive that has previously

performed the same or similar mission);

- e. discussion of activity hazard analysis; and
- f. emergency procedures.

30.A.16 If for any reason the dive mission is altered, the DDC/UDC shall be contacted by the dive inspector and a revised dive plan will be established, reviewed, and accepted by the DDC/UDC prior to continuing the operation. This review may be conducted electronically and confirmed in writing after completion of the dive operation.

30.A.17 For each diver and dive, the following dive log information, as a minimum, shall be recorded and maintained at the dive location:

- a. full name;
- b. date and location of dive;
- c. maximum depth and bottom time;
- d. surface interval between dives;
- e. breathing medium and type of equipment used;
- f. group classification at beginning and end of each interval;
- g. water and ambient air temperature;
- h. depth(s) and duration(s) of any decompression stops; and
- i. date and time of last previous dive.

30.A.18 For each dive in which decompression sickness and/or pulmonary barotrauma is suspected or symptoms are evident, the following information shall be recorded and maintained:

- a. description of signs and symptoms (including depth and time of onset);
- b. description and results of treatment; and
- c. name, address, and phone number of attending physician.

30.A.19 Copies of the dive logs shall be submitted to the DDC/UDC after completion of the dive operation.

30.B SCUBA DIVING OPERATIONS

30.B.01 SCUBA diving operations shall not be conducted:

- a. at depths greater than 30 m (100 ft);
- b. on dives outside the no-decompression limits unless a dual lock, multi-place, recompression chamber (capable of recompressing diver at the surface to a depth equivalent to 50 m (165 ft) of sea water) is available at the dive location and is immediately available for use, a diving physician or trained chamber operator is present, and the chamber is of sufficient size to accommodate the patient as well as the chamber tender;
- c. against currents exceeding one knot;
- d. in enclosed or physically confining spaces, unless line-tended with diver/surface two-way voice communications and an in-water tender/diver located at the underwater point of entry;
- e. using closed circuit or semi-closed circuit SCUBA; or
- f. in visibility less than 1 m (3 ft) unless line tended with diver/surface two-way voice communications.

30.B.02 Contractor SCUBA teams shall be manned in accordance with the criteria established in Appendix N.

30.B.03 Specific operational requirements for SCUBA operations are as follows:

- a. Each SCUBA diver shall be equipped with an alternate air source, e.g., an octopus or bailout bottle with a minimum of 0.85 m³ (30 ft³) of air and separate regulator. The safest method shall be analyzed and used during each dive operation.
- b. Each diver shall be equipped with a buoyancy compensation device (BCD) capable of maintaining the diver at the surface in a face-up position.
- c. Each SCUBA diver shall be equipped with a submersible cylinder pressure gauge capable of being monitored by the diver during the dive.

d. Each SCUBA diver shall be equipped with a weight belt or assembly capable of quick release.

e. Each SCUBA diver shall be equipped with a depth gauge and knife.

f. SCUBA air cylinders shall comply with the following requirements:

- (1) air cylinders of seamless steel or aluminum which meet DOT 3AA and DOT 3AL specifications are approved for use on USACE projects;
- (2) each cylinder used on USACE projects must have identification symbols stamped into the shoulder of the tank; and
- (3) SCUBA tanks used on USACE projects must be visually inspected internally at least annually and hydrostatically tested at least once every 5 years in accordance with DOT and the CGA regulations: test dates will be stamped into the shoulder of each tank.

g. A timekeeping device shall be used for recording diving times for all SCUBA diving operations. When two-way voice communications are not used, each dive supervisor and diver shall have a timekeeping device. When two-way voice communications are used, the dive supervisor, at a minimum shall have a timekeeping device.

h. Each tethered SCUBA diver shall wear a safety harness with a positive buckling device, attachment point for the safety line, and a lifting point to distribute the pull force of the line over the diver's body while maintaining the body in a heads-up vertical position when unconscious or inert.

30.C SURFACE SUPPLIED AIR OPERATIONS

30.C.01 Surface supplied air operations shall not be conducted at depths greater than 58 m (190 ft), except that dives with bottom times of 30 minutes or less may be conducted to depth of 67 m

(220 ft); exceptional exposure dives, as defined by the US Navy Diving Manual, shall not be conducted except in emergency lifesaving situations.

30.C.02 Surface supplied air equipment components shall be a type specifically designed to be used in diving support systems.

30.C.03 Dual lock, multi-place, recompression chambers shall be available and ready for use at the dive location for any dive outside the no-decompression limits or deeper than 30 m (100 ft). A diving physician, or a trained chamber operator in communication with a diving physician, shall be in attendance with the chamber.

30.C.04 A bell shall be used for dives with an in-water decompression time greater than 120 minutes, unless heavy gear is worn or diving is conducted in physically confining spaces.

30.C.05 Each surface supplied air diving team will be manned in accordance with the criteria established in Appendix N.

30.C.06 Minimum specific operational requirements for surface supplied air diving operations are as follows:

- a. each diver shall be continuously tendered while in the water, with one diver per tender, regardless of depth;
- b. an underwater tender/diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces;
- c. each diving operation shall have a primary breathing air supply sufficient to support divers for the duration of the planned dive, including decompression;
- d. a surface supplied standby diver will be dressed out and readily available when a diver is in the water (the standby diver may remove his or her head gear after it is tested for proper operation);
- e. except where heavy gear is worn, each diver must have a

reserve breathing supply available which can be turned on immediately by the diver in the event of loss of air;

f. each dive location shall have a reserve breathing air supply in-line capable of supporting the dive operation;

g. for dives deeper than 30 m (100 ft) or outside the no-decompression limits and using heavy gear, an extra air hose supplying breathing air to the diver shall be available to the standby diver: an in-water support stage shall be provided to divers in water when using heavy gear, regardless of depth; and

h. electronic communication systems shall be incorporated in all surface supplied air diving operations: all dives shall be terminated if voice communications are lost.

30.D MIXED-GAS DIVING OPERATIONS

30.D.01 Mixed-gas diving will be in compliance with the requirements of 29 CFR 1910 Subpart T, the Association of Diving Contractors (ADC) Consensus Standards for Commercial Diving Operations, and the requirements of this Section.

30.D.02 Mixed-gas diving shall be conducted only when a decompression chamber is ready for use at the dive location and either:

- a. a bell is used at depths greater than 67 m (220 ft) or when the dive involves in-water decompression time of greater than 120 minutes (except when heavy gear is worn or when diving in physically confining spaces), or
- b. a closed bell is used at depths greater than 90 m (300 ft), except when diving is conducted in physically confining spaces.

30.D.03 A separate dive team member shall tend each diver in the water.

30.D.04 A standby diver shall be dressed out and readily available while a diver is in the water. (The standby diver may remove his or her head gear after it is tested for proper operation.)

30.D.05 A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

30.D.06 Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive, including decompression.

30.D.07 Each diving operation shall have a dive-location reserve breathing gas supply.

30.D.08 When heavy gear is worn:

- a. an extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver, and
- b. an in-water stage shall be provided to divers in the water.

30.D.09 An in-water stage shall be provided for divers without access to a bell for dives deeper than 30 m (100 ft) or outside the no-decompression limits.

30.D.10 When a closed bell is used, one dive team member in the bell shall be available and tend the diver in the water.

30.D.11 Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided for each diver:

- a. diving deeper than 30 m (100 ft) or outside the no-decompression limits, or
- b. prevented by the configuration of the dive area from directly ascending to the surface.

30.E EQUIPMENT REQUIREMENTS

30.E.01 Equipment modifications, repairs, tests, calibrations, or maintenance shall be recorded by means of a tagging or logging

system, and include the date and nature of work performed and the name of the individual performing the work.

30.E.02 Air compressor systems used to supply air to surface supplied air divers shall be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.

30.E.03 Compressors shall be of sufficient capacity to overcome any line loss or other losses and deliver a minimum 4.5 cfm (actual) to each diver at the maximum diving depth.

30.E.04 Air compressor intakes shall be located away from areas containing exhaust or other contaminants.

30.E.05 Air compressor systems, both high pressure (SCUBA) and low pressure (surface-supplied) will be tested for air purity on a six-month basis by means of sampling at the connection to the distribution system. Purchased air will also be tested and certified.

- a. Proof of air certification shall be provided the USACE Command prior to the commencement of operations. Proof of air certification may be verified by submittal of the contractor's air testing logbook (or similar verification) or by submittal of private laboratory test results. Contractors may self-test contractor-owned air compressors.

b. Air purity standards are as follows:

- (1) air shall not contain a level of carbon monoxide greater than 20 ppm;
- (2) air shall not contain a level of carbon dioxide greater than 1,000 ppm;
- (3) air shall not contain a level of oil mist greater than 5 milligrams per cubic meter;
- (4) air shall not contain a level of hydrocarbons other than methane greater than 25 ppm; and

(5) air shall not contain a noxious or pronounced odor.

30.E.06 Breathing air supply hoses.

- a. Breathing air supply hoses shall meet the specifications listed in SAE 100-R3, have a working pressure of the total breathing gas system, and have a rated bursting pressure at least four times the working pressure.
- b. Breathing air supply hoses shall have connectors made of corrosion resistant materials and have a working pressure at least equal to the working pressure of the hose to which they are attached: connectors must not be able to become accidentally disengaged.
- c. Umbilicals shall be marked in 3 m (10 ft) increments to 30 m (100 ft) (beginning at the divers end) and in 15 m (50 ft) increments thereafter.
- d. Umbilicals shall have a nominal breaking strength of 1200 kg (2650 lb) and shall be made of kink resistant materials.
- e. A safety line of at least 1 cm (3/8 in) synthetic material shall be included as an integral part of each umbilical.
- f. Hoses must be tested at least annually to 1.5 times the working pressure.
- g. When hoses are not in use, their open ends must be closed by taping or other means.

30.E.07 Surface-supplied air and mixed gas helmets and masks shall have a non-return valve at the attachment between the helmet or mask and hose which will close readily and also have an exhaust valve; helmets and masks shall have a minimum ventilation rate capacity of 2.1 L/s (4.5 cfm) (actual) at the depth at which they are operated.

30.E.08 Surface-supplied air and mixed gas helmets and masks must be capable of supporting a reserve breathing supply which can be immediately turned on by the diver in event of loss of air.

30.E.09 Surface-supplied air and mixed gas helmets and masks must be capable of supporting a two-way, diver-surface communication system.

30.E.10 Weights and harnesses.

- a. Unless heavy gear is worn, divers shall be equipped with a weight belt or assembly capable of quick release.
- b. Unless heavy gear is worn, each diver shall wear a safety harness with a positive buckling device, attachment point for the safety line, and a lifting point to distribute the pull force of the line over the diver's body while maintaining the body in a heads-up vertical position when unconscious or inert.

30.E.11 The following emergency and first aid equipment shall be located at all dive sites:

- a. a first aid kit meeting the requirements of Section 3;
- b. an oxygen resuscitation system capable of delivering oxygen for a minimum of 30 minutes; and
- c. a stokes litter or backboard, with attached floatation device.

30.E.12 An appropriate dive flag will be displayed at the dive location during diving operations.

30.E.13 Hand-held power tools shall be tested and certified to be safe for underwater use; these tools shall be de-energized before being placed into or retrieved from the water and shall not be supplied with power until requested by the diver.

30.F ADVANCED DIVING TECHNOLOGY

30.F.01 The use of one-atmosphere suits, e.g., Newt Suits,

requires the specific approval of the HQUSACE Diving Coordinator prior to the use of such equipment.

30.F.02 The use of "enriched air" or Nitrox (EANx) breathing mixtures by contractors requires the prior approval by the DDC/UDC. Decompression tables designed specifically for the Nitrox mixture being used shall be followed without exception.

a. Contractors must provide evidence of training and experience with Nitrox breathing mixtures prior to actual diving operations.

b. Nitrox breathing mixture shall be analyzed/tested by the diver to assure proper mix prior to each use.

DEFINITIONS

Bell: an enclosed compartment, pressurized (closed bell) or unpressurized (open bell), which allows the diver to be transported to and from the underwater work area and which may be used as a temporary refuge during diving operations.

Bottom time: the total elapsed time, measured in minutes, from the time when the diver leaves the surface in descent to the time that the diver begins ascent.

Decompression sickness: a condition with a variety of symptoms which may result from gas or bubbles in the tissues of divers after pressure reduction.

Decompression table: a profile or set of profiles of depth-time relationships for ascent rate and breathing mixtures to be followed after a specific depth-time exposure or exposures.

Dive location: a surface or vessel from which a diving operation is conducted.

Diving inspector: a USACE employee who inspects a contractor's

diving operations while work is in progress. Diving inspectors shall be designated in writing by the USACE

Commander upon nomination by the employee's staff level supervisor and with concurrence of the UDC. Diving inspectors must have successfully completed a USACE diving safety, diving supervisor, or diving inspector course and shall maintain certification by attending a HQUSACE-sponsored diving inspectors course every four years.

Diving supervisor: the employer, or an employee designated by the employer, at the dive location in charge of all aspects of the diving operation which affect the safety and health of dive team members. The diving supervisor shall have experience and training in the conduct of the assigned diving operation.

Dive team: divers and support employees involved in a diving operation, including the diving supervisor.

Heavy gear: diver-worn deep-sea dress, including helmet, breastplate, dry suit, and weighted shoes, e.g., U.S. Navy Mark V gear.

In-water stage: a suspended underwater platform which supports a diver in the water.

Mixed-gas diving: a diving mode in which the diver breathes a mixture other than air, e.g., helium-oxygen.

No-decompression limits: the depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives" as specified in the U.S. Navy Diving Manual or equivalent.

Recompression chamber: a pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving system used to decompress divers to treat decompression sickness.

Safety and Occupational Health Office Dive Safety Representative: the Safety and Occupational Health Office representative assigned the responsibility of dive safety. This individual provides dive safety advice to operational elements and actively participates in the review and comment process for all diving plans and hazard analyses, as well as on-site monitoring of diving operations; must successfully complete the USACE diving safety, diving supervisor or diving inspector course and maintain certification by attending a HQUSACE-sponsored dive inspector course every four years. Unless required by position, this individual is not required to perform twelve working/training dives to maintain certification.

Standby diver: a diver at the dive location available to assist a diver in the water; standby divers will be dressed for immediate entry into the water.

USACE Diving Coordinator (UDC): a USACE employee assigned the responsibility for organizing, integrating, and monitoring the total dive program within a USACE Command. This individual and an alternate (to perform in the absence of the primary UDC) shall be appointed, in writing, by the USACE Commander/-Director and shall assure adherence to all applicable rules and regulations: at the Major Subordinate Command (Division), the Diving Coordinator shall provide program guidance and monitor and annually review the MSC dive program at all subordinate levels; at the District, Laboratory, and FOA level, the Diving Coordinator shall review all safe practices manuals, dive plans, medical certificates, and dive team qualifications and experience to assure compliance with this regulation. The UDC and the alternate shall, as a minimum, successfully complete the HQUSACE-approved Diving Safety or Diving Supervisor Training Course and shall maintain certification by attending the diving refresher course every four years. UDCs attending the Diving Safety course are not required to perform twelve working/-training dives unless they are in a dual position as a USACE diver or USACE Diving Supervisor.

SECTION 31

TREE MAINTENANCE AND REMOVAL

31.A GENERAL

31.A.01 Each location where tree maintenance or removal is done shall be under the direction of a qualified tree worker.

31.A.02 Working near electrical equipment and systems. **> Also see Section 11**

a. Employees working in the proximity of electrical equipment or conductors shall consider all such equipment or conductors energized with potentially fatal voltage, never to be touched (directly or indirectly).

b. An inspection shall be made by a qualified tree worker to determine whether an electrical hazard exists before climbing, otherwise entering, or performing any work in or on a tree.

c. Only a qualified line-clearance tree trimmer or qualified line-clearance tree trimmer trainee (under the direct supervision of qualified personnel) shall be assigned to the work if it is found that an electrical hazard exists.

d. There shall be a second qualified line-clearance tree trimmer or line-clearance tree trimmer trainee within normal voice communication during the clearing operations aloft under the following conditions:

- (1) when the line-clearance tree trimmer or line-clearance tree trimmer trainee must approach any closer than 3 m (10 ft) to any conductor or electrical apparatus energized in excess of 750 volts;
- (2) when branches or limbs being removed cannot first be cut (with a pole pruner/pole saw) sufficiently clear of the equipment or conductors so as to avoid contact; or